

CLAIMS:

20. A method for optical control of the quality of a process of chemical mechanical planarization (CMP) by determining the existence of a residues effect on an article resulting from the CMP process applied to said article, the CMP processed article
5 having a surface with at least one pattern in the form of spaced-apart metal regions, the method comprising the steps of:

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- selecting at least one predetermined site on the article to be controlled by analysing a structure which is similar to that of said article to be controlled but under-polished by the CMP process, and detecting the effect of residues on said under-polished structure, said at least one predetermined site being that where the effect of residues is detected;
 - illuminating said at least one predetermined site on said article to be controlled, detecting light returned from the illuminated site, and generating data indicative of the detected light; and
 - 15 - analysing said data for determining the existence of the effects of residues.

21. The method according to Claim 20, wherein said selecting of the at least one predetermined site comprises the steps of:

- providing an image of said structure; and
- performing image processing of said image.

22. The method according to Claim 21, wherein said image processing comprises at least one of the following steps:

- detecting at least one site of the structure characterised by substantially irregular geometry;
- detecting at least one site of the structure characterised by predetermined optical properties indicative of a predetermined range of contrast of said image;
- 25 - detecting at least one site of the structure characterised by optical properties different from optical properties of other sites of the structure.

23. The method according to Claim 20, wherein said selecting of the at least one
30 predetermined site comprises the steps of:

- providing data indicative of spectral characteristics of said structure; and
- analysing said data indicative of spectral characteristics of said structure.

24. The method according to Claim 23 wherein said analysing of the data indicative of spectral characteristics of said structure comprises determining optical properties of a material on top of the structure.

25. The method according to Claim 23, wherein said analysing of the data indicative of spectral characteristics of said structure comprises determining a thickness of the uppermost layer of the structure.

26. The method according to Claim 20, wherein the CMP process is applied to the article containing stacks each formed by a different layer structure, the method also comprising the step of providing information regarding a location of at least one of erosion and dishing effects on a layer underneath the top layer of the structure, said at least one predetermined site being selected at said location.

27. The method according to Claim 20, wherein the analysed structure is an article similar to the article to be controlled.

28. The method according to Claim 20, wherein the analysed structure is a simulated model of said article to be controlled.

29. The method according to Claim 20, wherein said analysing of the generated data comprises image processing of an image of the at least predetermined site formed by the detected light.

30. The method according to Claim 30, wherein said analysing of the generated data comprises at least one of the following steps:

- detecting the existence of substantially irregular geometry within said at least one predetermined site;
- detecting predetermined optical properties of said at least one predetermined site indicative of a predetermined range of said image; and
- detecting difference in optical properties of said at least one predetermined site and other sites of the structure.

31. The method according to Claim 21, wherein said analysing of the generated data comprises image processing of an image of the at least predetermined site formed by the detected light.

32. The method according to Claim 31, wherein said analysing of the generated data comprises at least one of the following steps:

- detecting the existence of substantially irregular geometry within said at least one predetermined site;
- 5 - detecting predetermined optical properties of said at least one predetermined site indicative of a predetermined range of said image; and
- detecting difference in optical properties of said at least one predetermined site and other sites of the structure.

33. The method according to Claim 23, wherein said analysing of the generated data comprises image processing of an image of the at least predetermined site formed by the detected light.

34. The method according to Claim 33, wherein said analysing of the generated data comprises at least one of the following steps:

- 15 - detecting the existence of substantially irregular geometry within said at least one predetermined site;
- detecting predetermined optical properties of said at least one predetermined site indicative of a predetermined range of said image; and
- detecting difference in optical properties of said at least one predetermined site and other sites of the structure.

20 35. The method according to Claim 20, wherein said generated data is indicative of spectral characteristics of said article to be controlled.

36. The method according to Claim 35, wherein said analysing of the generated data comprises determining optical properties of a material on top of the structure.

25 37. The method according to Claim 35, wherein said analysing of the generated data comprises determining a thickness of the uppermost layer of said article to be controlled.

38. The method according to Claim 21, wherein said generated data is indicative of spectral characteristics of said article to be controlled.

39. The method according to Claim 38, wherein said analysing of the generated data comprises determining optical properties of a material on top of the structure.

40. The method according to Claim 38, wherein said analysing of the generated data comprises determining a thickness of the uppermost layer of said article to be controlled.

41. The method according to Claim 23 wherein said generated data is indicative of spectral characteristics of said article to be controlled.

42. The method according to Claim 41, wherein said analysing of the generated data comprises determining optical properties of a material on top of the structure.

43. The method according to Claim 41, wherein said analysing of the generated data comprises determining a thickness of the uppermost layer of said article to be controlled.

44. The method according to Claim 37, and also comprising the step of utilising the determined thickness to adjust a working parameter of a processing tool to carry out the CMP processing of a further similar article.

45. The method according to Claim 40, and also comprising the step of utilising the determined thickness to adjust a working parameter of a processing tool to carry out the CMP processing of a further similar article.

46. The method according to Claim 40, and also comprising the step of utilising the determined thickness to adjust a working parameter of a processing tool to carry out the CMP processing of a further similar article.

47. A tool used in manufacturing semiconductor wafers, the tool comprising a polisher to be applied to the wafer for performing a chemical mechanical planarization (CMP) of an uppermost layer of the wafer to define at least one surface pattern in the form of spaced-apart metal regions spaced by non-metal regions, and an optical monitoring system operable to apply optical inspection to at least one predetermined site on the wafer for determining the existence of residues effect caused by the CMP process.

48. The tool according to Claim 47, wherein said optical monitoring system comprises:

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- a spectrophotometer for applying to the processed wafer to illuminate at least one predetermined site on the wafer by incident radiation of a pre-set substantially wide wavelength range and detect light reflected from the illuminated site for providing measured data representative of photometric intensities of detected light within said wavelength range;
 - an imaging arrangement operable to acquire images formed by light reflected from the wafer.
- 10 - a processor unit connectable to the spectrophotometer, the processor unit being preprogrammed with a pattern recognition software for analyzing the acquired image to locate said at least one predetermined site, and being operable to analyse said measured data and generate corresponding data to be used for adjusting a working parameter of the polisher prior to be
- 15 applied to a further wafer.

49. The tool according to Claim 47, wherein said optical monitoring system comprises an imaging arrangement operable to acquire images formed by light reflected from the wafer and generating measured data indicative thereof; and a processor unit connectable to the imaging arrangement and being preprogrammed

20 with a pattern recognition software for analyzing said measured data and generating corresponding data to be used for adjusting a working parameter of the polisher prior to be applied to a further wafer.
